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Complications of Anesthesia

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Many surgical procedures and many invasive diagnostic and therapeutic procedures by non-surgeons are carried out under anesthesia or sedation. Anesthetic agents are administered by a variety of routes including topically, by inhalation, and intravenously, and all involve some risk to the patient in addition to that associated with the procedure itself.[1] Cardiovascular, renal, and neurologic adverse effects have all beenassociated with the administration of anesthesia.

Many of the procedures requiring the administration of anesthesia are performed in the hospital inpatient setting. Hospitals have reported patient-level discharge data for inpatients to the Department of Health since 1989, and these data include diagnostic codes for complications of anesthesia. This paper presents a descriptive analysis of the complications of anesthesia reported by hospitals over a ten-year period ending in 2000.

Methods. All acute-care hospitals in Rhode Island submit a specified set of line-item data from every hospital inpatient stay in accordance with licensure regulations. Up to eleven diagnoses made during the hospital admission are included as codes from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM).[2] Any discharge with one or more of eight ICD-9-CM codes or code groups identified as complications of anesthesia (Table 1) was considered a case for this analysis. (One type of complication, "poisoning by central nervous system depressants," includes effects that may result either from the incorrect administration of anesthetics in the hospital or from illicit use of drugs prior to admission. In order to exclude events of the latter type, codes for poisonings from anesthetics known to be abused by illicit users (e.g., cocaine) were excluded from the definition.) The analysis included all such discharges during the ten-year period from October 1, 1990, through September 30, 2000, corresponding to hospital fiscal years 1991-2000.

Hospital discharge data do not contain an indicator for the administration of anesthesia during procedures performed during the inpatient stay. An estimate of the proportion of patients undergoing anesthesia was therefore constructed using charges reported by the hospitals for anesthesia services. Because of variations in hospital reporting and billing practices for anesthesia charges, the estimate was based on data from six hospitals for fiscal years 1997-2000, comprising over 300,000 discharges. Among this subset, 31.12% of discharges had anesthesia charges reported. This proportion was applied to all discharge data included in the analysis to estimate the number of patients at risk for a complication of anesthesia. The number of events each year was divided by the estimated population at risk to arrive at annual rates of complications per 1000 persons anesthetized.

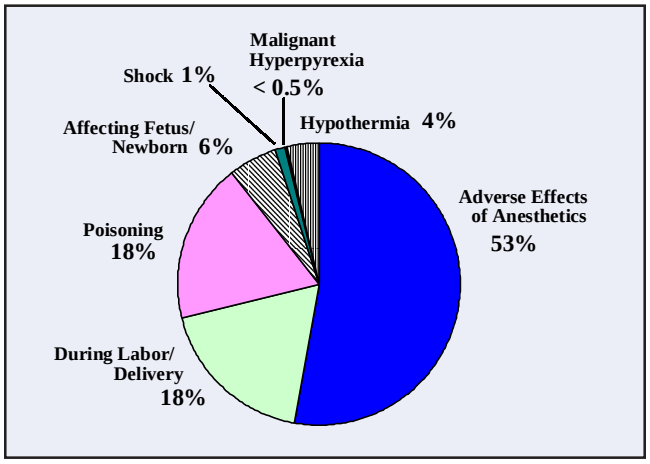

Figure 1. *Complications of anesthesia among hospital inpatients, by type of complication, Rhode Island, fiscal years 1991-2000.*

ICD-9-CM Diagnosis Code	Complication	Number of Discharges
668	Complications of anesthesia during labor and delivery	139
763.5	Fetus or newborn affected by maternal anesthesia	42
968, excluding 968.5	Poisoning by central nervous system depressants and anesthetics, excluding surface and infiltration anesthetics (e.g., cocaine)	137
995.4	Shock due to anesthesia	9
995.86	Malignant hyperpyrexia due to anesthesia, etc.	2
995.89	Hypothermia due to anesthesia, etc.	27
E938	Drugs causing adverse effect during therapeutic use: Central nervous system depressants and anesthetics	397
E876.3	Misplacement of endotracheal tube during anesthetic procedure	0

Table 1. *Complications of anesthesia among hospital inpatients, by type of complication, Rhode Island, fiscal years 1991-2000.*

Results. Over the ten-year period, there were 730 hospital discharges of patients with one or more complications of anesthesia reported, among a total number of discharges equaling 1,319,685, of which an estimated 410,686 involved anesthesia. There were 23 discharges with more than one of the eight diagnosis codes representing these complications. The most commonly reported complications were adverse effects of central nervous system depressants and anesthetics (reported in 54.4% of the 730 discharges), complications of anesthesia during labor commonly reported and delivery (19.0%), and poisonings by central nervous system depressants and anesthetics (18.8%). (Table 1; Figure 1)

The overall rate of complications of anesthesia for the ten-year period was 1.8 per 1000 persons anesthetized (estimated). Annual rates ranged from a low of 1.2 per 1000 in FY1991 to a high of 2.2 complications per 1000 in FY2000. (Figure 2) There was no significant trend in the rate over time.

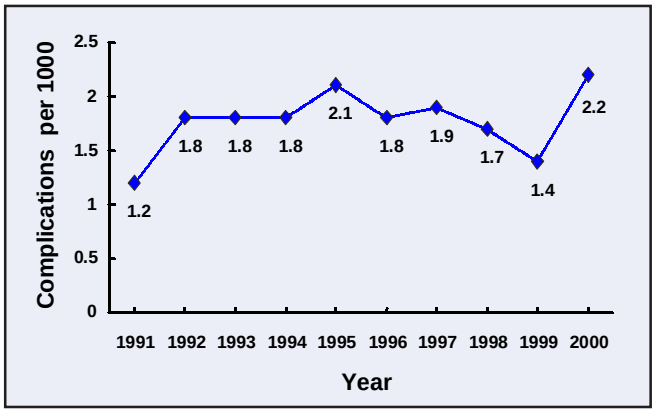

Figure 2. *Complications of anesthesia per 1000 anesthetized hospital inpatients, by year, Rhode Island, fiscal years 1991-2000.*

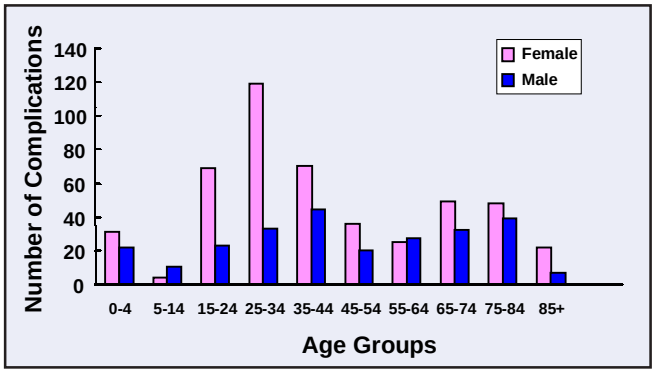

Figure 3. *Complications of anesthesia among hospital inpatients, by age group and sex, Rhode Island, fiscal years 1991-2000.*

There were strong variations in the occurrence of anesthesia complications by age group and sex. (Figure 3) A small peak during infancy to age four was followed by low numbers during middle childhood, but the highest numbers were found in young adulthood rather than in old age. This was especially true among women, who comprised 64.8% of all hospitalizations with complications of anesthesia; the peak in early adulthood represented primarily women undergoing an obstetric procedure. For males, there was no discernable pattern of procedures to account for their relatively smaller peak in early adulthood; the most common types of procedure reported for males with complications of anesthesia were in the group "miscellaneous diagnostic procedures" (28.7% of discharges).

Inpatient mortality was lower among patients who had a complication of anesthesia than was generally found among hospitalized patients during the ten-year period. Eleven of the 730 patients with complications (1.5%) were discharged dead, whereas 2.6% of all hospitalizations ended in death. The hospital discharge data do not contain information that links the cause of an inpatient death to a specific diagnosis, such as an anesthesia complication.

Conclusions. Based on information reported in hospital discharge data, complications of anesthesia are rare occurrences among inpatients in Rhode Island hospitals. Fewer than one-quarter of one percent of patients receiving anesthesia experience such complications. It should be noted that anesthesia complications are only reported in the source hospital discharge data if the complication is mentioned in the medical record and is coded during data abstraction. There is no independent verification of the completeness or accuracy of reporting for these complications.

Women ages 15-44 years and men ages 35-44 were more likely than hospitalized persons of other ages to have a reported complication of anesthesia. The number of women of childbearing age experiencing complications is elevated primarily due to their increased risk during labor and delivery. For males, no specific surgical procedure or group of surgical procedures was associated with complications of anesthesia. Finally, there is no apparent increased risk of mortality among patients with these complications; inpatient mortality is actually lower among these patients than among all inpatients, perhaps reflecting the better underlying health of surgical patients.

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